

years ago, it has been found that bars which are constructed of copper alloys do not retain their original length with that degree of accuracy now demanded for scientific purposes. The new copy (I.P.) is made of an alloy containing 89.81 per cent. of platinum and 10.10 per cent. of iridium, such an alloy being little affected by changes of temperature and not at all by oxidation; as the alloy admits of a high specular polish, the fine lines marking the extremities of the yard can be traced directly on the bar without the intervention of gold plugs or pins as in the older type. Instead of using the old solid 1-inch section, for the purpose of lightness the so-called "Tresca" section has been adopted. The memorandum gives full details of the verification of the length and a description of the apparatus used, including the thermometers by which temperature was measured and a new microscopic "comparator" similar to that used at Paris by the Comité international des Poids et Mesures. This instrument has been purchased by the Board of Trade and mounted in a special chamber at Old Palace Yard, Westminster.

VESSELS of fused quartz can now be obtained commercially, and on account of the remarkable properties of this substance, a wide field of research at high temperatures would appear to be opened up by their use. In high temperature gas thermometry, for example, where glass is excluded on account of its comparatively low melting point, and platinum on account of its permeability to hydrogen, fused quartz promised to be an ideal envelope. Unfortunately, Villard has found that fused quartz is also permeable to hydrogen at high temperatures, well below its melting point, and Jacqueroed and Perrot have proved that helium resembles hydrogen in this respect. In the current number of the *Comptes rendus* (March 27) M. Berthelot shows that the use of quartz vessels is still further limited, as both oxygen and nitrogen can penetrate into hermetically sealed quartz bulbs at 1300° C. Thus carbon, heated in sealed vacuum quartz tubes for half an hour at 1300° C., gave a mixture of nitrogen and carbon monoxide on cooling the tube and extracting the gases. Experiments were made on other substances, and all the facts pointed to the conclusion that at a high temperature fused silica behaves towards gases like an animal membrane, susceptible of endosmosis and exosmosis, the phenomenon depending partly on the thickness of the wall. It is clear, therefore, that before this substance can be used with confidence in high temperature work, a further study will have to be made of its defects in this direction.

THE *Comptes rendus* for March 27 contain an interesting paper on the cryoscopic behaviour of hydrocyanic acid, by M. Lespieau. According to the views of Nernst and Thomson on the relation between the dielectric capacity and the power of electrolytic dissociation, the fact that the dielectric constant of prussic acid is higher than that of water should give the acid a higher dissociating power. M. Lespieau has accordingly carried out a series of experiments on the lowering of the freezing point of this substance by the addition of alcohol, chloroform, benzene, water, trichloroacetic acid, sulphuric acid, potassium iodide and nitrate, and has found that for the first six substances the cryoscopic constant is between 19 and 20, whilst for the two latter it is approximately double. Hence the two acids, which are strongly dissociated in water, are not sensibly dissociated in prussic acid solutions of the same strength, and this is in accord with the experiments of Kahlenberg, who found that these solutions were bad con-

ductors, these facts being in contradiction with Nernst's theory. On the other hand, the solutions of potassium salts in hydrocyanic acid were found by Kahlenberg to be better conductors than aqueous solutions of the same concentration, and this agrees with the cryoscopic results, according to which the two salts are nearly completely dissociated into their ions in prussic acid.

MR. W. WOODS SMYTH will give a lecture on "The Bible in the Light of Modern Science" at Stafford Rooms, Tichborne Street, Edgware Road, to-morrow, April 7, at 5 p.m.

MESSRS. WATTS AND CO. will shortly publish, for the Rationalist Press Association, Prof. Haeckel's "Evolution of Man," being a translation of the recently issued fifth edition of "Anthropogenie."

OUR ASTRONOMICAL COLUMN.

COMET 1905 a (GIACOBINI).—A second telegram from the Kiel Centralstelle announces that comet 1905 a was observed by Prof. Aitken at Lick on March 27. The position at March 27d. 7h. 57.1m. (Lick M.T.) was R.A.=5h. 48m. 55s., dec.=+12° 35' 43".

Apparently, then, the northern declination is increasing, and not decreasing as previously stated. An error in the key by which the code telegrams are translated substituted declination for N.P.D., so that the daily movement in declination should be read as *plus* 1° 15'.

The following elements have been computed by Dr. E. Strömberg from observations made on March 26, 28, and 30, and are given in *Circular* No. 76 of the Kiel Centralstelle, together with a bi-daily ephemeris extending from March 30 to April 23:—

Elements.

$$\begin{aligned} T &= 1905 \text{ April } 3^{\text{rd}} 20^{\text{h}} 9^{\text{m}} 8^{\text{s}} \text{ (M.T. Berlin).} \\ \omega &= 357^{\circ} 9' 49'' \\ \Omega &= 156^{\circ} 7' 94'' \\ i &= 41^{\circ} 37' 48'' \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} 1905.0$$

$$\log q = 0.05232$$

Ephemeris 12h. (M.T. Berlin).

1905	α			δ	$\log \Delta$	Bright- ness
	h.	m.	s.	°		
April 7 ...	6	31	16 ...	+25 26.9 ...	9.8661 ...	0.98
9 ...	6	40	5 ...	+27 39.9 ...		
11 ...	6	49	13 ...	+29 48.1 ...	9.8745 ...	0.93
13 ...	6	58	39 ...	+31 50.9 ...		
15 ...	7	8	22 ...	+33 47.9 ...	9.8855 ...	0.87

Brightness on March 26 = 1.0.

PHOTOGRAPHY OF THE CORONA WITHOUT A TOTAL ECLIPSE.—According to a note communicated to the French Academy of Sciences, and in the opinion of M. J. Janssen, M. A. Hansky has succeeded in photographing the corona of the uneclipsed sun. The photographs were taken with a 12-inch telescope in the exceptionally transparent atmosphere which obtains at the observatory situated on the summit of Mont Blanc.

After a number of preliminary experiments on the selective absorption of screens dyed with various aniline colours, M. Hansky obtained a combination which absorbed all radiations more refrangible than 660 μ , and, as the red radiations of the corona are very intense and do not suffer absorption or dispersion in passing through the terrestrial atmosphere, he used this screen in obtaining twelve negatives. The individual screens were prepared by soaking a fixed undeveloped Lumière film in each of the suitable dyes, and, between each exposure, they were re-arranged *inter se* so that no false effect due to any particular disposition of the "grain" might affect the resulting picture. The direct photospheric and chromospheric rays were prevented from reaching the plate by

the interposition of a blackened brass disc slightly larger than the solar disc.

The resulting negatives showed distinct halos around the disc, and, notwithstanding the fact that some time elapsed between the successive exposures, these halos exhibited the same form, thus testifying to their solar origin. Some of the negatives were photographically intensified by repeated copying, and reproductions of them were submitted to the academy. In presenting the communication M. Janssen—to whom M. Hansky acknowledges his obligations for assistance and advice—stated that “the photographs actually show the solar corona with an intensity and a perfection only known on the photographs obtained during total eclipses” (*Comptes rendus*, No. 12).

SEARCH-EPHEMERIS FOR TEMPEL'S FIRST PERIODIC COMET (1867 II).—Although Tempel's first comet has not been seen during its last three perihelion passages, *i.e.* since 1879, M. A. Gautier, of the Geneva Observatory, thinks that the probability of its re-discovery this year is great enough to justify a careful search. For this reason he re-publishes, in No. 4008 of the *Astronomische Nachrichten*, the elements he prepared for the 1898 apparition, reduced to the mean equinox of 1905.0. As the probable time of perihelion is somewhat uncertain, he gives three ephemerides, extending from March 31 to July 13, in which this time is reckoned as May 2.5, April 20.5, and April 8.5 respectively, the mean date being the most probable. The declination varies from -16° to -31° , so that the more southerly observatories are more likely to be successful in the research.

RIGHT ASCENSIONS OF 2120 SOUTHERN STARS.—In an appendix to “Observations made at the Hong Kong Observatory during 1903,” Prof. W. Doberck, the director, publishes the right ascensions of 2120 southern stars for the epoch 1900, as determined from observations made by Mr. J. I. Plummer and himself during the years 1898 to 1904.

The observations were made with a 3-inch Simms semi-portable transit instrument, which, together with the method of reduction and the comparisons with other catalogues, is briefly discussed in the director's preface.

In the catalogue itself, the number of the star as given in Lacaille, or Stone, or both, the R.A., epoch and magnitude, the variation of the R.A. from Stone's corresponding value, the proper motion, and several other particulars are given for each star.

THE IRIS DIAPHRAGM IN ASTRONOMY.—In a communication to the French Academy of Sciences, M. Salet states that he has recently and usefully adapted the iris diaphragm to a telescope in which the magnification employed is 500. The diaphragm is placed very near to the plane of the micrometer wires in front of the field lens, and its *raison d'être* is to prevent the light from the sky, and from the illumination of the wires, from reaching the eye when feeble objects are being observed, the diaphragm being closed by an external cylinder when the object has been brought to the centre of the field. By reducing the extent of the micrometer wires, the diaphragm also reduces, or eliminates, the effect of astigmatism when observations of double stars are being made (*Comptes rendus*, No. 9).

CONSTANCY OF “SPARK” WAVE-LENGTHS.—A question which is of first importance to those observers engaged in stellar line-of-sight work, *viz.* that of the constancy of wave-lengths in spark spectra taken under various conditions of discharge, has recently been re-investigated by Mr. G. W. Middlekauff at the Johns Hopkins University. A detailed description of the apparatus and methods employed, together with the results obtained, appear in No. 2, vol. xxi., of the *Astrophysical Journal*.

Mr. Middlekauff used a concave Rowland grating of 20,000 lines to the inch and a focal length of 21.5 feet. The self-induction in the spark circuit could be varied from 0.00007 to 0.0012 of a henry, and the capacity from 0.0085 to 0.0739 of a microfarad, and the results obtained afford strong evidence that in the case of a spark discharge in air, at atmospheric pressure, no “shift” in wave-length is produced by variations of self-induction or capacity

within the above limits. A further result obtained was that the analogous wave-lengths in the arc and the spark spectra of the same elements are not measurably different.

STATISTICS OF VARIATION.¹

A PAPER consisting mainly of a large number of elaborate records bearing on the important subject of variation has recently been issued by the Washington Academy of Sciences. The data, which have been collected with much care and industry, cannot fail to be of high interest to all students of evolution. They afford an excellent example of the peculiar value of insect studies in reference to many difficult problems in biology—a point which has lately received fresh emphasis from Prof. Poulton's valedictory address as President of the Entomological Society of London.

The authors start with an “Introduction,” in which they declare their “belief in the marked betterment and effectiveness of practically all variation study when pursued from the point of view of the biometrician”; adding, however, that “from the writers' point of view the study of variation is a phase of biology, and not of mathematics.” Dealing with the special advantages presented by insect data in this inquiry, they assert that the phenomena of complete metamorphosis afford a ready means of distinguishing “variations which are strictly blastogenic from others which may be in large part acquired.” This, it may be remarked, is only true under certain limitations. It is not the case, for instance, as the authors appear to think, that the imaginal colour-patterns of lepidoptera are uninfluenced by the conditions obtaining during individual development.

Coming now to the main substance of the paper, we find a series of short articles or sections giving statistics of variation in some two dozen species of insects. Among the structures thus dealt with are the venation and costal wing hooks in bees and ants, the venation in gnats, the colour-patterns of sundry beetles, wasps and bugs, the eye-spots of certain butterflies, the tibial spines, tarsal and antennal segments, tactile hairs and elytral striæ of other insects of various orders. In the case of the hive bee it is incidentally shown that the parthenogenetically produced drones are as subject to variation in their wings as are the workers of biparental ancestry. The results are in many cases graphically summarised in the form of the frequency polygon; and the “mode,” “standard deviation,” “index of variability,” and “coefficient of variation” are duly reckoned and recorded in accordance with approved biometrical methods. It is interesting but not surprising to observe that the frequency curve is usually in fair correspondence with the law of error.

The paper ends with a section devoted to “general results.” Here we think that too much is made of the difficulty of distinguishing between congenital variation and acquired modification. For practical purposes the distinction is usually obvious enough. A little later the authors observe, “The most satisfactory answer to the question of the hereditary transmission of acquired characters will come as the result of a quantitative (statistical) study of variations known to be blastogenic compared with a similar study of variations known to be acquired, both studies to be made on complete series of individuals bred under quantitatively determined life conditions.” This seems to us somewhat like using a steam-hammer to crack an egg. It is not astonishing to find that there is little or no evidence of differing selection-value in the variable number of spots on the elytra of a ladybird; but it hardly seems clear that the authors are justified in claiming this fact, together with an apparent change of “mode” between the years 1895 and 1901, as evidence in favour of “determinate variation.” Before any such inference can properly be drawn, the question of possible correlation ought at least to be considered. The authors, however, arrive on the whole subject at the satisfactory conclusion that natural selection “is after all a logical necessity and undoubtedly an actual actively-regulative factor” in the formation of species.

F. A. D.

¹ “Studies of Variation in Insects.” By Vernon L. Kellogg and Ruby G. Bell, of Leland Stanford Junior University. From the *Proceedings of the Washington Academy of Sciences*, vol. vi. (Washington, D.C., 1904)